



# APALACHICOLA RIVER AND BAY WATERSHED EXPLORATIONS

Apalachicola National Estuarine Research Reserve



## WHERE OH WHERE, DID THE RAINWATER GO? THIRD GRADE

Apalachicola National Estuarine Research Reserve  
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## WHERE, OH WHERE, DID THE RAINWATER GO?

### CONCEPT

Students will conduct an experiment to determine how water moves through different soils found in the Apalachicola River watershed. This activity will help students understand the jobs of a hydrologist and a geologist.

### OBJECTIVES

1. Students will understand the basic components of a hydrologist's job.
2. Students will understand the basic components of a geologist's job.
3. Students will understand that water's movement in and across the ground is affected by soil type.
4. Students will understand that some rainwater eventually forms major water bodies in the Apalachicola River watershed, while some rainwater seeps into the ground.
5. Students will be able to identify areas of the Apalachicola River watershed on a map.

### METHOD

Students will experiment with a variety of soil types to learn how rainwater behaves in the Apalachicola River watershed.

**Grade level:** 3<sup>rd</sup> Grade

**Subjects:** Science, Social Studies, Language Arts, Mathematics

**Location:** This activity should be done in a lab setting or outside. There will be water involved.

**Materials:** Cleanup items for water spills; Items in the activity module

**Duration:** Two class periods

**Sunshine State Standards:** Listed on p. 8 of the activity

### PREPARATION ACTIVITIES:

If desired and time allows, the teacher can use the Enviroscape to show how runoff occurs and how pollutants or sediments can be carried through an aquatic system.

### GETTING READY:

1. Hang the watershed map in an easily accessible area.
2. Check the soil experiment sets found in the module to make sure each one has all of its parts and is ready for use.

3. Have cleanup items on hand in case of water spills.

### ACTIVITY:

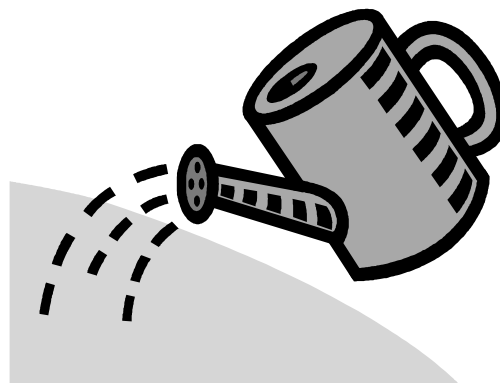
1. Read the background reading passage aloud to your students.
2. Ask students if they know how water gets into the rivers and estuaries of the Apalachicola Bay area. They may say that rain goes directly into these areas to form them. Ask them to think of other ways water gets into these water bodies and then ask what role they think the type of soil

water runs across plays in the formation of rivers and estuaries.

3. Read the activity scenario section to your class.
4. Show students the watershed map and point out some familiar areas (i.e. hometown, beaches).
5. Break students into groups of 2-4 students, enough so that each group will have a soil experiment set.
6. Give each group a research packet and a soil experiment set.
7. Each student group will have 2 scenarios in their soil experiment set. Have the student groups read the scenarios one at a time and then follow the directions included to conduct their experiments.
8. Each student will fill out the experiment and data sheets that accompany the activity.
9. Once the groups have completed both experiments they will check their data sheets to ensure that the important information was recorded. Students then clean up their area and let the teacher know when they are done.
10. When all groups are finished, teachers should lead a group discussion and ask the follow-up questions.

### FOLLOW-UP QUESTIONS:

1. What did you notice about how water flows through each of the soil types?
  - a. Sand
  - b. Loam
  - c. Clay
  - d. Rock
2. Looking at the map, where do you think the water went after it fell on the ground? (Point out certain areas on the map and have students theorize about where rainwater went. If the rain seeped into the ground, where did it go? If the rain didn't seep into the ground, where did it go?)
3. If the runoff water carried pollutants, how do you think it would affect the watershed?



### ACTIVITY SCENARIO:

*Imagine that you are a team of **hydrologists** and **geologists** studying how water moves through the soils of the Apalachicola River watershed. You want to find out how rainfall affects the water supply in the area. The region has been experiencing a lot of storms lately and your team will get a weather report that tells where a storm occurred and how much rain fell. Your job is to use the map in your research packet to find out where the rain fell and what type of soil it fell on. Then you will conduct an experiment with a soil sample from that area to discover where the rainwater went. Follow the steps and answer the questions on the experiment and data sheets.*

## ASSESSMENT:

### Team Assessment

1. Have each team draw the water movement from their model on a copy of the Apalachicola River watershed map.
2. Have each team make a presentation to the class about the results of their experiment.

### Individual Assessment

1. Each student will turn in their experiment and data sheets.
2. Have students conduct research at their library or on the Internet to gather more information about the kinds of projects that hydrologists or geologists work on. Using magazine pictures, each student can then make a collage and write a paragraph about the job of a hydrologist or geologist.

## POST ACTIVITIES:

Aquatic WILD Wetland Metaphors  
Video: *Waters Journey, The Hidden Rivers of Florida* by Wes Skiles



**The Apalachicola River**

## RESOURCES:

- ☛ U.S. Geological Survey website education section at <http://www.usgs.gov/education/>
- ☛ U.S. Geological Survey FAQ, "What does a hydrologist do?" [http://interactive2.usgs.gov/faq/list\\_faq\\_by\\_category/get\\_answer.asp?id=264](http://interactive2.usgs.gov/faq/list_faq_by_category/get_answer.asp?id=264)
- ☛ U.S. Geological Survey Hydrology Primer <http://ut.water.usgs.gov/infores/hydrology.primer.html>
- ☛ U.S. Geological Survey FAQs About Geology [http://interactive2.usgs.gov/faq/list\\_faq\\_by\\_category/get\\_questions\\_for\\_category.asp?category\\_id=10](http://interactive2.usgs.gov/faq/list_faq_by_category/get_questions_for_category.asp?category_id=10)
- ☛ *WaterDrops: A Water Resource Newsletter*, Volume 1, Issue 2, Southwest Florida Water Management District. Download at [http://www.swfwmd.state.fl.us/infoed/waterdrops/wd\\_2.pdf](http://www.swfwmd.state.fl.us/infoed/waterdrops/wd_2.pdf)
- ☛ *Florida Waters*, by E.D. Purdum, Institute of Science and Public Affairs, Florida State University, completed for Florida's Water Management Districts. Download at <http://sjr.state.fl.us/programs/outreach/pubs/index.html>
- ☛ Florida's Water Management Districts:
  - <http://www.state.fl.us/nwfwmd/>
  - <http://www.srwmd.state.fl.us/>
  - <http://sjr.state.fl.us/>
  - <http://www.swfwmd.state.fl.us/>
  - <http://www.sfwmd.gov>

## BACKGROUND READING FOR WHERE, OH WHERE, DID THE RAINWATER GO?

**Hydrologists** are scientists that study and protect our water supplies. Some hydrologists manage water by making sure we have enough water when there is a drought and making sure we don't get flooded when it rains too much. Other hydrologists make sure our water quality is good by measuring how clean the water is. They study water quality because it is important to have clean and safe water for drinking, for farming, for business, and for swimming.

**Geology** is the study of the Earth, and the changes that have occurred through time to create the Earth as we know it today. These changes can be seen in the rocks and soils that cover the Earth. Rocks and soils give clues to weather, plants and animals, and major changes that have occurred over time. **Geologists** are scientists that study rocks, minerals, and fossils. Geologists also investigate major natural forces such as earthquakes, volcanic activity, and landslides. They may also study fossils to determine how living things have changed over many years.

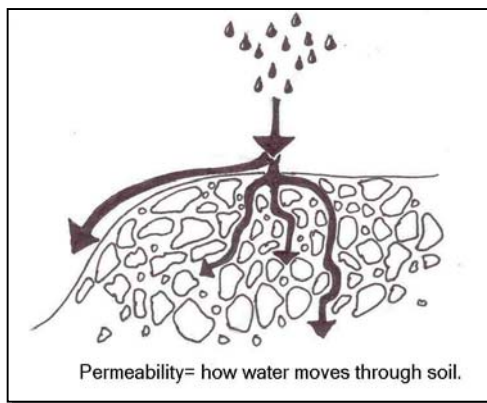
When hydrologists and geologists get together, they often talk about how water and soil interact on planet Earth. The movement of water over and through soil is a major force that creates change on Earth. Water's movement over time can produce amazing results.

One example is the Grand Canyon of the western United States, a place where water has been flowing over rocks for a very long time, eroding a canyon over a mile deep and several miles wide.

Another example is the state of Florida, which has been covered and uncovered by ancient oceans many times, resulting in a peninsula built from sandy soils and old beach dunes.

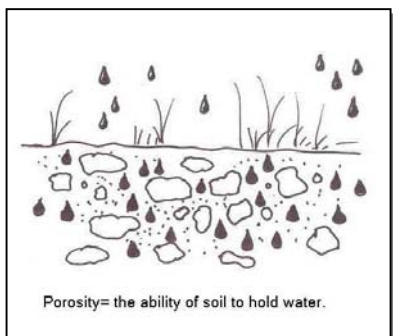
The type of soil in an area will affect the movement of water. There are two important measures of how soil affects water movement: **permeability** and **porosity**.

**Permeability** measures how easily water flows into and through the soil or rock. An example of permeability is how easily the water soaks into the ground if you were to pour a glass of water it.



## BACKGROUND READING CONTINUED: WHERE, OH WHERE, DID THE RAINWATER GO?

**Porosity** is the ability of the soil or rock to absorb and hold water. This is similar to how a sponge soaks up and holds water. An example of high porosity is the soil in a cypress swamp that has lots of spongy organic (dead plant) matter in it.



A soil or rock formation that holds a lot of water is said to have high porosity. A soil or rock formation has high permeability if it allows water to flow easily through it. Soils with loose space between particles have higher permeability than soils with less space between the particles, like rocks.

When water from rain flows over the surface of the soil as **runoff**, some of it will seep into the ground and travel downward until it reaches the **water table**. The water table is the level below the soil's surface where the ground is saturated with water. The water table in Florida is usually fairly close to the surface of the soil.

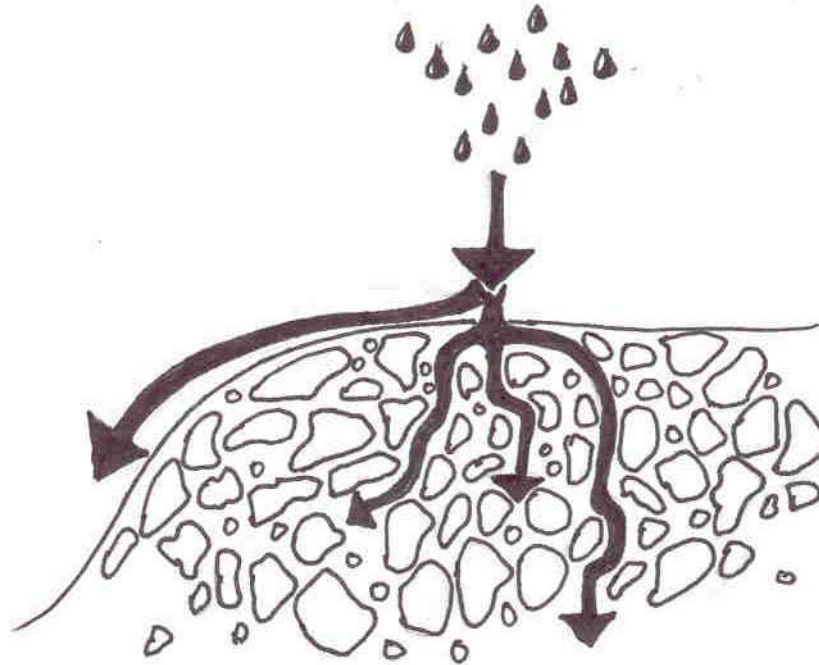
This underground water is called **groundwater**. The groundwater seeps slowly through permeable underground soils into rivers, streams, and the ocean, or into underground water storage **aquifers**.

The amount of space between soil particles has an effect on the speed of flow of the groundwater. Water flows faster through some types of soils than others. When all the spaces between the soil particles become filled with water, the soil is **saturated**. Saturated soil is full of water like a soaking wet sponge.

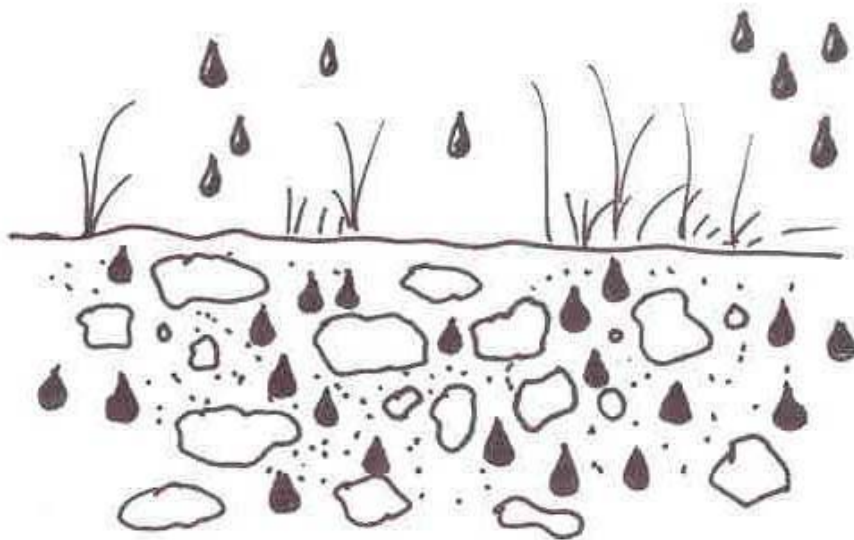
**Topography** also affects the movement of water **runoff** on the surface of the soil. Topography includes the surface features of a place or region, things like hills, valleys, swamps, rivers, lakes, islands, and oceans. Steeper slopes will cause water to move away more quickly, while gentle slopes may cause water bodies to form like lakes or rivers or swamps.

Soil and rock formations can filter some **pollutants** out of runoff and groundwater before they reach the river or ocean. Pollutants are things that are bad for the environment, such as poisons and some chemicals. This filtering ability depends on the permeability and composition of the soil. Some types of soil such as clay and loam are good filters of pollutants because they are less permeable and the water seeps through them more slowly. Sand and gravel, however, are not such good filters of pollutants, because the water soaks through them fairly quickly. There is a limit to the amount of pollutants any soil can filter. It is important to protect swamps and marshes so they can naturally clean the pollutants from the water before it reaches the river or ocean.





Permeability= how water moves through soil.



Porosity= the ability of soil to hold water.

## VOCABULARY

**Gravel:** A mixture of rock fragments or pebbles.

**Sand:** Loose, gritty particles of worn or disintegrated rock, vary in size from 1/16 mm to 2 mm in diameter, usually deposited on shores of beaches and rivers.

**Loam:** A rich soil composed of clay, sand, and some organic matter derived from living plants or animals.

**Silt:** A fine soil, with particles that are intermediate in size between those of sand and clay.

**Clay:** A very fine soil, composed of minerals with a crystal structure that are produced by the chemical break down of rocks. Clay usually feels slippery between the fingers because of the small particles.

**Geology:** The study of the Earth, which includes the history of life on Earth and the events that have occurred throughout time that brought changes to the planet.

**Geologist:** A scientist that studies and manages land, energy, and mineral resources.

**Hydrology:** The study of water sources and water quality on Earth.

**Hydrologist:** A scientist that studies and protects our water supplies and resources.

**Permeability:** The measure of how easily water flows through the rock or soil.

**Porosity:** The ability of the soil or rock to absorb and hold water.

**Saturated:** Filled completely to the point where no more can be absorbed.

**Runoff:** The movement of excess water from the land into swamps, rivers, bays, or oceans. Runoff may cause flooding. Runoff from urban and agricultural areas often includes fuels, chemicals, cleansers, fertilizers, and other human-made pollutants.

**Pollutants:** Chemicals that are carried in runoff that are bad for the environment, including things like fuels, chemicals, cleansers, fertilizers, and other human products. Pollutants may cause negative changes or death in living things or systems.

**Water table:** The level below the soil's surface where the ground is saturated with water. This can change depending on how much groundwater is present.

**Groundwater:** Water that soaks into the soil and is stored in shallow groundwater areas or deeper aquifers.

**Aquifer:** An underground water storage area within layers of porous rock or sand. Aquifers are often used as sources of human drinking water. In the Apalachicola area, we get our drinking water from the **Floridan Aquifer**.

**Topography:** The surface features of a place or region including things like hills, valleys, swamps, rivers, lakes, islands, and oceans.



## SUNSHINE STATE STANDARDS ACTIVITY CORRELATIONS

### Science

#### Processes that Shape the Earth

Standard 1: The student recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth.(SC.D.1.2)

SC.D.1.2.2: knows that 75 percent of the surface of the Earth is covered by water.

SC.D.1.2.3: knows that the water cycle is influenced by temperature, pressure, and the topography of the land.

SC.D.1.2.4: knows that the surface of the Earth is in a continuous state of change as waves, weather, and shifts of the land constantly change and produce many new features.

SC.D.1.2.5: knows that some changes in the Earth's surface are due to slow processes and some changes are due to rapid processes.

Standard 2: The student understands the consequences of using limited natural resources. (SC.G.2.2)

SC.G.2.2.1: knows that all living things must compete for Earth's limited resources; organisms best adapted to compete for the available resources will be successful and pass their adaptations (traits) to their offspring.

SC.G.2.2.2: knows that the size of a population is dependent upon the available resources within its community.

SC.G.2.2.3: understands that changes in the habitat of an organism may be beneficial or harmful.

#### The Nature of Science

Standard 1: The student uses the scientific processes and habits of mind to solve problems (SC.H.1.2)

SC.H.1.2.1: knows that it is important to keep accurate records and descriptions to provide information and clues on causes of discrepancies in repeated experiments.

SC.H.1.2.2: knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate the results.

SC.H.1.2.3: knows that to work collaboratively, all team members should be free to reach, explain, and justify their own individual conclusions.

SC.H.1.2.4: knows that to compare and contrast observations and results is an essential skill in science.

SC.H.1.2.5: knows that a model of something is different from the real thing, but can be used to learn something about the real thing.



Standard 2: The student understands that most natural events occur in comprehensible, consistent patterns. (SC.H.2.2)

SC.H.2.2.1: knows that natural events are often predictable and logical.

## **Social Studies**

### People, Places, and Environments [Geography]

Standard 1: The student understands the world in spatial terms. (SS.B.1.2)

SS.B.1.2.1 uses maps, globes, charts, graphs, and other geographic tools including map keys and symbols to gather and interpret data and to draw conclusions about physical patterns.

Standard 2: The student understands the interactions of people and the physical environment. (SS.B.2.2)

SS.B.2.2.3 understands how human activity affects the physical environment.

SS.B.2.2.4 understands how factors such as population growth, human migration, improved methods of transportation and communication, and economic development affect the use and conservation of natural resources.

## **Language Arts**

### Reading

Standard 2: The student constructs meaning from a wide range of texts. (LA.A.2.2)

LA.A.2.2.1 reads text and determines the main idea or essential message, identifies relevant supporting details and facts, and arranges events in chronological order.

LA.A.2.2.5: reads and organizes information for a variety of purposes, including making a report, conducting interviews, taking a test, and performing an authentic task

LA.A.2.2.8: selects and uses a variety of appropriate reference materials, including multiple representations of information, such as maps, charts and photos, to gather information for research projects.

### Writing

Standard 1: The student uses writing processes effectively. (LA.B.1.2.)

LA.B.1.2.1: prepares for writing by recording thoughts, focusing on central idea, grouping related ideas, and identifying the purpose for writing.

LA.B.1.2.2: Drafts and revises writing in cursive that: focuses on the topic; has logical organizational pattern, including a beginning, middle, conclusion, and transitional devices; has ample development of supporting ideas; demonstrates a sense of supporting ideas; demonstrates a sense of completeness or wholeness; demonstrates a command of language including precision in word choice; generally



has correct subject/verb agreement; generally has correct verb and noun forms; with few exceptions, has sentences that are complete, expect when fragments are used purposefully; uses a variety of sentence structures; and generally follows the conventions of punctuation, capitalization, and spelling.

#### Number Sense, Concepts, and Operations

The student understands the different ways number are represented and used in the real world. (MA.A.1.2)

MA.A.1.2.1: names whole numbers combining three-digit numeration (hundreds, tens, ones) and the use of number periods, such as ones, thousands, and millions and associates verbal names, written word names, and standard numerals with whole numbers, commonly used fractions, decimals, and percents.

MA.A.1.2.2: understands the relative size of whole numbers, commonly used fractions, decimals, and percents.

MA.A.1.2.3: understands concrete and symbolic representations of whole numbers, fractions, decimals, and percents in real-world situations.

MA.A.1.2.4: understands that numbers can be represented in a variety of equivalent forms using whole numbers, decimals, fractions, and percents.

#### Data Analysis and Probability

Standard 1: The student understands and uses the tools of data analysis for managing information. (MA.E.1.2)

MA.E.1.2.1: solves problems by generating, collecting, organizing, displaying, and analyzing data using histograms, bar graphs, circle graphs, line graphs, pictographs, and charts.



## Experiment and Data Sheet for Weather Report 1

Name: \_\_\_\_\_

### Where, Oh Where, Did the Rainwater Go?

*Complete each step as a group and answer the questions on your own.*

**Step 1:** Listen to your teacher read the Activity Scenario.

**Step 2:** Get Weather Report 1 from your Research packet and read it aloud in your group.

**Step 3:** Look at the Apalachicola River watershed map that is in your Research packet and determine where the storm in Weather Report 1 occurred.

*What section did the storm occur in (A,B,C, etc.)?*

*Write down at least 1 natural feature such as a river, forest, or bay that is nearby.*

*What type of soil is found where the storm occurred?*

*How much rain fell during your storm?*

**Step 4:** Get the soil type that matches the soil type where the rain fell.

**Step 5:** Fill the measuring cup with the amount of rain that matches the amount of rain that fell during the storm.

**Step 6:** Put the soil container into the large plastic container labeled “\_\_\_”.

*Does this soil look like it will hold much water?*

*What do you think will happen when you pour the water over your soil? How much water do you think will stay in the soil? How much will come out of the soil if any?*

## Experiment and Data Sheet for Weather Report 1

**Step 7:** Pour the “rainfall” from the measuring cup into the watering can. Pour the water from the watering can like rain onto your soil container. Watch what happens when the water enters the soil.

*What do you see?*

**Step 8:** Wait for 2 minutes and then take your soil container out of the plastic container.

**Step 9:** Once your soil container is set aside, look at what is left in the plastic container and record the following observations:

1. *How much water (if any) flowed out of the soil?*
2. *How much water was absorbed by the soil?*
3. *Did any of your soil wash out with the water? How can you tell?*
4. *As hydrologists and geologists you are studying how the rainwater flows through the soil and where it goes. Look at the map again and **hypothesize** where the rainwater that fell during the storm went. Write your hypothesis here and include where the water that seeped into the soil went as well as where the water that flowed through the soil went:*

**Step 10:** Make sure you have answered all of the questions on this sheet. After this sheet is complete, clean up and then get Weather Report 2. Complete the Experiment and Data Sheet for Weather Report 2.

## Experiment and Data Sheet for Weather Report 2

Name:

### Where, Oh Where, Did the Rainwater Go?

*Complete each step as a group and answer the questions on your own.*

**Step 1:** Remember that you are geologists and hydrologists conducting a soil study.

**Step 2:** Get Weather Report 2 from your Research packet and read it aloud to your group.

**Step 3:** Look at the Apalachicola River watershed Map that is in your Research packet and determine where the storm in Weather Report 2 occurred.

*What section did the storm occur in (A,B,C, etc.)?*

*Write down at least 1 natural feature such as a river, forest, or bay that is nearby.*

*What type of soil is found where the storm occurred?*

*How much rain fell during your storm?*

**Step 4:** Get the soil type that matches the soil type where the rain fell.

**Step 5:** Fill the measuring cup with the amount of rain that matches the amount of rain that fell during the storm.

**Step 6:** Put the soil container into the large plastic container labeled “\_\_\_”.

*Does this soil look like it will hold much water?*

*What do you think will happen when you pour the water over your soil? How much water do you think will stay in the soil? How much will come out of the soil if any?*

**Step 7:** Pour the “rainfall” from the measuring cup into the watering can. Pour the water from the watering can like rain onto your soil container. Watch what happens when the water enters the soil.

*What do you see?*

**Step 8:** Wait for 2 minutes and then take your soil container out of the plastic container.

**Step 9:** Once your soil container is set aside, look at what is left in the plastic container and record the following observations:

5. *How much water (if any) flowed out of the soil?*
6. *How much water was absorbed by the soil?*
7. *Did any of your soil wash out with the water? How can you tell?*
8. *As hydrologists and geologists you are studying how the rainwater flows through the soil and where it goes. Look at the map again and **hypothesize** where the rainwater that fell during the storm went. Write your hypothesis here and include where the water that seeped into the soil went as well as where the water that flowed through the soil went:*

**Step 10:** Make sure you have answered all of the questions on this sheet. Once all questions are completed, clean up your experiment and tell your teacher that your team is done.